



EP3260: Machine Learning Over Networks  
Homework Assignment 3  
Due Date: March 5, 2023

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### Problem 3.1

Consider the optimization problem on slide 11 of Lecture 6. Show that for convex and closed  $f$ :  $\mathbf{A}\mathbf{w} - \mathbf{b} \in \partial g(\boldsymbol{\lambda})$  where  $\partial$  is the set of subgradients.

### Problem 3.2

Consider the dual ascent algorithm on slide 11 of Lecture 6. Analyze the convergence of dual ascent for  $L$ -smooth and  $\mu$ -strongly convex  $f$ . Is the solution primal feasible?

### Problem 3.3

Consider the optimization problem (P2) on slide 21 of Lecture 6. Extend the dual decomposition of Slide 6-12 to solve (P2). Compare it to the primal method (analytically or numerically) in terms of total communication cost and convergence rate on a random geometric communication graph.